



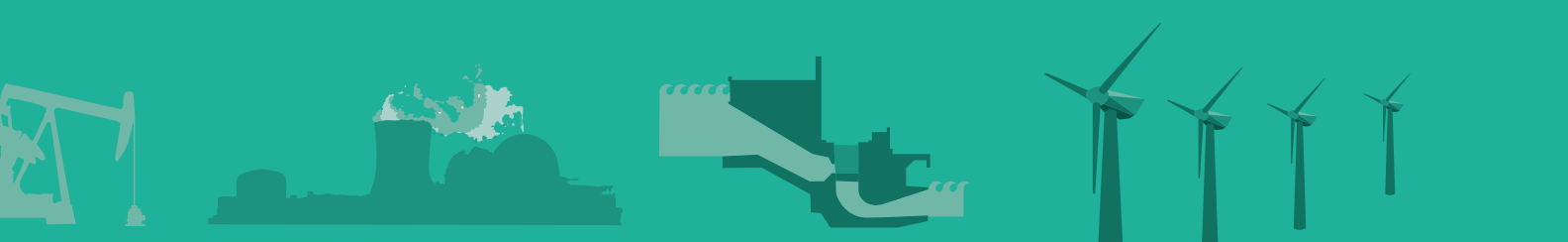
Chapter 2 Dreams of a Sustainable Future

Can you spot the sources of renewable energy in this photograph? You most likely identified the wind turbines that punctuate the skyline; but through careful observation, you may have also identified that the entire upper surface of the car is covered with photovoltaic cells. This futuristic car is an experimental race vehicle that runs entirely on solar energy. The lessons learned from experimental vehicles like this may, some day, help engineers to come up with alternatives to the conventional automobiles that rely on fossil fuels. A much less obvious form of renewable energy in this photo is the crop of corn in the background. Corn can be used to make ethanol—a renewable fuel. Ethanol can be used to supplement or possibly even replace petroleum.

With so many hungry people in the world, is it wise to turn a potential food into fuel? Are there other questions surrounding the widespread use of wind turbines, photovoltaic cells, biomass, or other renewable energy technologies? What kinds of questions need to be asked before you can decide which technologies are suitable choices for meeting current and future energy demands?

In this chapter you will have an opportunity to investigate many sources of renewable energy that are alternatives to the use of non-renewable fuels. This knowledge will offer you more than just a way to look to the future; it will also provide you with a valuable opportunity to summarize many key concepts from the entire course.





Try This Activity

Process Maps

Background Information

Earth is a closed system. This means that matter must be continuously cycled. The water cycle and the carbon cycle, which you studied in previous courses, are examples of biogeochemical cycles for matter. Energy, in most cases from the Sun, is important to the cycling of matter.



Science Skills

- ✓ Performing and Recording
- ✓ Analyzing and Interpreting

Purpose

In this activity you will prepare process maps depicting the energy and matter changes for photosynthesis, combustion of fossil fuels, and nuclear fission.

Procedure

Obtain three copies of the handout “Process Map” from the Science 30 Textbook CD.



step 1: On the first copy of the handout, write “Photosynthesis” in the box in the centre.

step 2: In the upper-left quadrant of the diagram (Energy Input), identify the energy inputs for photosynthesis. You may use a list or arrows to indicate flow or changes that occur.

step 3: Repeat step 2 for the other quadrants: Energy Output, Matter Input, and Matter Output.

step 4: Repeat these steps for the combustion of fossil fuels and for nuclear fission.

Analysis

1. On your process maps, identify matter outputs or energy outputs that may harm the biosphere.
2. Identify any process that is able to use the energy output as an energy input. (Can energy be recycled?)
3. Can the matter output from any of the processes be transformed back into a matter input? (Can matter be recycled?) If so, compare the rates for the processes. (Can the matter be replenished as quickly as it is being used?)
4. Recall the definition for renewable energy. Identify the processes that are renewable. Identify which processes could be used to meet energy needs in the short term and over the long term. Give reasons for your answers.